

## CLAIMS

1. A joint (50, 60) for bringing into communication: a first fluid passageway wherethrough fluid passes; and a second fluid passageway (Pp) of a nut member (20), which comprises said second fluid passageway (Pp), a female thread part (22), and a first tapered part (21) inclined 5 toward the outer circumferential side and toward said female thread part side; and comprising:

a push rod (52); and

a main body (51), comprising:

10 a push rod storage space (SPi) that houses said push rod (52) so that one part of said push rod (52) protrudes along a push rod longitudinal direction (X);

a communication path (Pi2) for communicating with said first fluid passageway and provided in said main body on an opposite side (X2) of a push rod protruding side of the push rod storage space (SPi) in the push rod longitudinal direction (X);

15 a seal structure forming part (53, 163) provided at an end part on a push rod protruding side (X1) in the push rod longitudinal direction (X) so that it surrounds the outer circumference of said push rod storage space (SPi), and capable of forming a seal structure by contacting said first tapered part (21); and a male thread part (54) capable of screwing together with said female thread part (22) along the push rod longitudinal direction (X);

20 wherein,

when said female thread part (22) and said male thread part (54) are screwed together, then said seal structure forming part (53, 163) contacts said first tapered part (21); and one part of the portion of said push rod (52) protruding from said push rod storage space (SPi) contacts one part of said nut member (20), said push rod (52) moves toward 25 the opposite side (X2) of the push rod protruding side along the push rod longitudinal direction (X), and brings into communication said second fluid passageway (Pp) and said communication path (Pi2).

2. The joint (50) as recited in Claim 1, wherein

30 said seal structure forming part (53, 163) is a second tapered part (53) inclined toward the outer circumferential side and toward the opposite side (X2) of the push rod protruding side in the push rod longitudinal direction (X).

3. The joint (50) as recited in Claim 2, wherein

an angle ( $\delta$ ) formed by an inclination direction (Si1) of said second tapered part (53) with the push rod longitudinal direction (X) is less than or equal to an angle ( $\beta$ ) formed

by an inclination direction (Sp) of the first tapered part (21) with the push rod longitudinal direction (X) in a state wherein said female thread part (22) and said male thread part (54) are screwed together.

4. The joint as recited in Claim 2 or Claim 3, wherein

5        said second tapered part (53) is provided with a first projection part (123a, 123b) that projects toward the outer circumferential side; and  
      said first projection part (123a, 123b) forms a seal structure by contacting said first tapered part (21) and deforming.

5. The joint as recited in Claim 1, wherein

10      said seal structure forming part (53, 163) is a convex spherical surface part (163).

6. The joint as recited in any one claim of Claim 1 through Claim 5, wherein

      said seal structure forming part (53, 163) comprises a sealing member (145, 155, 175) as a separate body; and  
      said sealing member (145, 155, 175) forms a seal structure by contacting said first tapered part (21) and deforming.

15      7. The joint as recited in Claim 6, wherein

      said seal structure forming part (53, 163) further comprises a groove (147, 187) for supporting said sealing member (145, 155, 175).

8. The joint (50) as recited in any one claim of Claim 1 through Claim 7, wherein

20      said push rod (52) comprises a second projection part (52a) at the portion protruding from said push rod storage space (SPi) and that projects toward the outer circumferential side, wherein said second projection part contacts said first tapered part (21), and said push rod (52) moves toward the opposite side (X2) of the push rod protruding side along the push rod longitudinal direction (X) and brings into communication said second fluid passageway (Pp) and said communication path (Pi2).

25      9. The joint (50) as recited in Claim 8, wherein

      said second projection part (52a) comprises a third tapered part (52b) inclined toward the outer circumferential side and toward the opposite side (X2) of the push rod protruding side in the push rod longitudinal direction (X); and

30      said third tapered part of said push rod contacts said first tapered part (21), and said push rod moves toward the opposite side (X2) of the push rod protruding side along the push rod longitudinal direction (X) and brings into communication said second fluid passageway (Pp) and said communication path (Pi2).

10. The joint (60) as recited in any one claim of Claim 1 through Claim 7, wherein

5 said push rod (62) comprises a fourth tapered part (62c) provided at the end part on the push rod protruding side (X1) in the push rod longitudinal direction (X) and that is inclined toward the outer circumferential side and toward the opposite side (X2) of the push rod protruding side in the push rod longitudinal direction (X);

10 said fourth tapered part contacts said first tapered part (21), and said push rod (62) moves toward the opposite side (X2) of the push rod protruding side along the push rod longitudinal direction (X) and brings into communication said second fluid passageway (Pp) and said communication path (Pi2).

15 11. A joint (50, 60) for bringing into communication: a third fluid passageway wherethrough fluid passes; and a fourth fluid passageway (Pf) of a piping (30), which comprises said fourth fluid passageway (Pf), and a fifth tapered part (31) inclined radially and toward an end part; and comprising:

20 a push rod (52); and

25 a main body (51), comprising:

15 a push rod storage space (SPi) that houses said push rod (52) so that one part of said push rod (52) protrudes along a push rod longitudinal direction (X);

20 a communication path (Pi2) for communicating with said third fluid passageway and provided in said main body on an opposite side (X2) of a push rod protruding side of the push rod storage space (SPi) in the push rod longitudinal direction (X);

25 a seal structure forming part (53, 163) provided at an end part of the main body on a push rod protruding side (X1) in the push rod longitudinal direction (X) so that it surrounds the outer circumference of said push rod storage space (SPi), and capable of forming a seal structure by contacting said fifth tapered part (31);

30 a male thread part (54); and

a nut member (40) comprising:

15 a female thread part (42) capable of screwing together with said male thread part (54) along the push rod longitudinal direction (X);

20 an opening (HL) for inserting said piping (30); and

25 a sixth tapered part (41) inclined toward the outer circumferential side and toward said female thread part side;

wherein,

when said female thread part (42) and said male thread part (54) are screwed together in a state wherein said piping (30) is inserted in said opening (HL) so that said fifth tapered part (31) contacts said sixth tapered part (41), then said seal structure forming

part (53, 163) and said sixth tapered part (41) sandwich and press one part of said fifth tapered part (31); and

one part of the portion of said push rod (52) protruding from said push rod storage space (SPi) contacts another part of the fifth tapered part (31), said push rod (52) moves toward the opposite side (X2) of the push rod protruding side along the push rod longitudinal direction (X), and brings into communication said fourth fluid passageway (Pp) and said communication path (Pi2).

5 12. The joint as recited in Claim 11, wherein

said seal structure forming part (53, 163) is a seventh tapered part (53) inclined toward the outer circumferential side and toward the opposite side (X2) of the push rod protruding side in the push rod longitudinal direction (X).

10 13. The joint (50) as recited in Claim 12, wherein

an angle ( $\delta$ ) formed by an inclination direction (Si1) of said seventh tapered part (53) with the push rod longitudinal direction (X) is less than or equal to an angle (g) formed by an inclination direction (Sf) of the sixth tapered part (41) with the push rod longitudinal direction (X) in a state wherein said female thread part (42) and said male thread part (54) are screwed together.

15 14. The joint as recited in Claim 12 or Claim 13, wherein

said seventh tapered part (53) is provided with a third projection part (123a, 123b) that projects toward the outer circumferential side; and  
said third projection part (123a, 123b) forms a seal structure by contacting said fifth tapered part (31).

20 15. The joint (50) as recited in Claim 11, wherein

said seal structure forming part (53, 163) is a convex spherical surface part (163).

25 16. The joint as recited in any one claim of Claim 11 through Claim 15, wherein

said seal structure forming part (53, 163) comprises a sealing member (145, 155, 175) as a separate body; and  
said sealing member (145, 155, 175) forms a seal structure by contacting said fifth tapered part (31) and deforming.

30 17. The joint as recited in Claim 16, wherein

said seal structure forming part (53, 163) further comprises a groove (147, 187) for supporting said sealing member (145, 155, 175).

18. The joint as recited in any one claim of Claim 11 through Claim 17, wherein

said push rod (52) comprises a fourth projection part (52a) that projects toward the

outer circumferential side at the portion protruding from said push rod storage space (SPi), wherein said fourth projection part contacts another part of said fifth tapered part (21), said push rod (52) moves toward the opposite side (X2) of the push rod protruding side along the push rod longitudinal direction (X), and brings into communication said fourth fluid passageway (Pp) and said communication path (Pi2).

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19. The joint as recited in Claim 18, wherein

said fourth projection part (52a) comprises an eighth tapered part (52b) inclined toward the outer circumferential side and toward the opposite side (X2) of the push rod protruding side in the push rod longitudinal direction (X); and

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said eighth tapered part of said push rod contacts another part of said fifth tapered part (21), said push rod moves toward the opposite side (X2) of the push rod protruding side along the push rod longitudinal direction (X), and brings into communication said fourth fluid passageway (Pp) and said communication path (Pi2).

20. The joint as recited in any one claim of Claim 11 through Claim 17, wherein

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said push rod (62) comprises a ninth tapered part (62c) provided at the end part on the push rod protruding side (X1) in the push rod longitudinal direction (X) and that is inclined toward the outer circumferential side and toward the opposite side (X2) of the push rod protruding side in the push rod longitudinal direction (X);

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said ninth tapered part contacts another part of said fifth tapered part (21), said push rod (62) moves toward the opposite side (X2) of the push rod protruding side along the push rod longitudinal direction (X), and brings into communication said fourth fluid passageway (Pp) and said communication path (Pi2).